



PATENT

PD-10982033-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Confirmation No.: 5127

JOSEPH W. TSANG ET AL

Serial No.: 09/761,451

Group Art Unit: 1714

Filed: January 16, 2001

Examiner: C. E. Shosho

For: **POLYMERIC ADDITIVES TO IMPROVE PRINT QUALITY
AND PERMANENCE ATTRIBUTES IN INK-JET INKS**

Assistant Commissioner of Patents
Washington, D.C. 20231

DECLARATION UNDER 37 CFR 1.132

Sir:

We, JOSEPH W. TSANG and JOHN R. MOFFATT, declare and state as follows:

1. We are the co-inventors named in the above-identified patent application.
2. We have reviewed U.S. Patent 5,640,187, issued on June 17, 1997, to Akio Kashiwazaki et al. This patent is cited by the Examiner in the above-identified patent application as the primary reference in (a) rejecting Claims 10 and 14-15 as being unpatentable over Kashiwazaki et al in view of Lawrence et al (U.S. Patent 6,280,027) and Thompson et al (U.S. Patent 6,341,856) and (b) rejecting Claims 11-13 as being unpatentable over Kashiwazaki et al in view of Lawrence et al, Thompson et al, and Kurabayashi et al (U.S. Patent 5,985,975).
3. The Kashiwazaki et al reference was cited by Applicants in an Information Disclosure Statement submitted with the patent application. This reference discloses an ink-jet recording method and apparatus therefore. The method comprises discharging an ink droplet composed

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of an ink composition containing a pigment, a water-soluble resin for dispersing the pigment, and water to a recording medium. The recording method further comprises discharging a solution containing particles and/or binder polymer onto the recording medium, prior to discharging the ink.

4. The Examiner argues that that Kashiwazaki et al disclose a fixative for ink-jet printing wherein the fixative underprints the ink and wherein the fixative comprises vehicle and 0.001-20% polyurethane, citing Col. 2, lines 18-27, Col. 6, lines 25-29, Col. 7 lines 18-19 and 23-25 of the reference. The Examiner contends that the difference between Kashiwazaki et al. and the present claimed invention is the requirement in the claims of (a) two-part system, (b) glass transition temperature and melting temperature of the polymer, and (c) amount of reactive monomer.

5. With respect to difference (a), the Examiner notes that the present claims require a fixative comprising a reactive monomer such as isocyanate and second component such as polyol wherein the reactive monomer and second component react to form a polymer on the printing medium while Kashiwazaki et al disclose jetting a fixative comprising polyurethane onto a printing medium. The Examiner argues that it is well known that polyurethane is formed by the reaction of isocyanate and polyol. The Examiner further argues that the present claims are directed to a fixative, and further that the claimed fixative is the same as the fixative of Kashiwazaki et al once the isocyanate and polyol are reacted on the printing medium, that is, after reaction the claimed fixative comprises polyurethane, i.e., formed by the reaction of isocyanate and polyol, as does the reference fixative, it is not seen as to how the process of forming the fixative by separately combining the ingredients via a reaction between isocyanate and polyol (two-part system) would lead to the fixative as being patentable over the same fixative formed by directly jetting the polymer into the printing medium (one-part system). Moreover, there is no evidence to indicate any criticality of the two-part system over the one-part system.

6. Applicants direct their comments herein to the nature of their claimed two-part system with respect to the one-part system of Kashiwazaki et al. There are several reasons why

the *in situ* formation of urethane polymers ("two-part system") is superior in ink-jet printing to the use of preformed polymers ("one-part system"):

- (a) cross-linking performed in place;
- (b) topographical concerns of the print media surface;
- (c) solubility of the monomers (isocyanates and polyols) much easier to achieve than with the use of preformed polymers in the ink; and
- (d) variety of cross-linking monomers can be successively applied to the print sample.

7. With regard to aspects (a) and (b): With polymerization occurring on the adhering surface of the media, the overall binding of the polymer is enhanced. That is, as polymerization occurs, the crystalline structure of the polymer adapts to the crevices, fissures, and overall shape and form of the surface of the print media, thereby efficiently confining the colorant between the polymer and the media. This enhances the fastness properties of the colorant to the media, particularly the water fastness and smudge proofing of the colorant on the media, compared to a preformed polymer dissolved in the ink. In situations where a preformed polymer or a polymer already present in the ink or applied to the surface by a different pen, what usually occurs is that the dissolved polymer does not adhere efficiently and completely cover the media surface. Thus, the performance of the preformed polymer is not as good as the one polymerized on the surface of the media. However, it is not obvious what monomers to use such that the *in situ* polymerization reaction proceeds rapidly and extensively enough so that the monomers actually react on the surface of the media as desired to form polymer, rather than uselessly penetrating into the media matrix and not reacting.

8. With respect to aspect (c): Our experience has been that the addition of polymers to thermally-fired ink-jet inks has disadvantageous rheological and surface-active properties. The shear rate of extruding drops from the orifices of ink-jet pens is extremely large. High molecular weight species do not obey Newtonian flow when subjected to these shear forces and, as a general result, aberrations in drop weight and trajectory occurs with their use. It is a general rule of thumb for those experienced in this art that it is rare that a naturally occurring or synthetic polymer can perform well in the presence of these extrusion forces. Usually, if polymers are present in the ink, pen drop ejection performance is compromised and requires extensive

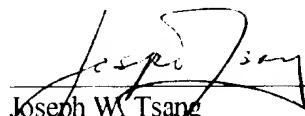
redesign of the ink-jet firing chamber and orifice structures to accommodate these polymers in the ink. Additionally, the decap or crusting performance is adversely affected with high molecular weight species. Thus, if a preformed polymer is to be used in the ink, it must not deteriorate pen performance. This severely limits the number of useable polymers in ink-jet inks. Simple molecules on the other hand, such as monomer precursors for polymers, have much lower molecular weights and depart less from Newtonian flow. Their use precludes extensive and costly re-design of pens. Thus, it is highly desirable to use simple, low molecular weight compounds in ink-jet compositions.

9. With regard to aspect (d): From a marketing viewpoint, it would be advantageous to have several fixer pens to accomplish specialty fixing; that is, when the printed sample will (a) be exposed to the environments of extensive humidity, (b) be exposed to extreme amounts of ambient office light or sunlight, or (c) be subject to repetitive abrasion. Thus, having on hand for the end-user several fixer pens containing several various monomers, that when polymerized on the media solve these fastness issues, is highly desirable.

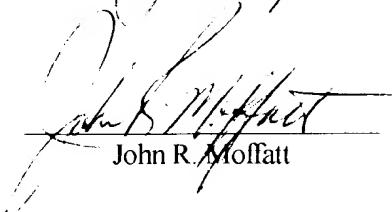
10. We conclude, based on the foregoing, that it would not be obvious to one skilled in the art, faced with the teachings of Kashiwazaki et al, to select the right conditions that must be determined empirically to achieve the desired effect.

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Dated: June 24, 2002


Joseph W. Tsang

Dated: June 24, 2002


John R. Moffatt